



CALFed Progress Questionnaire  
California Sea Grant College Program

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ProjectYear\_2A 1st

ProjectNo\_2C R/SF-21

TypeQuestionnaire\_2B Interim Questionnaire

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**Project Information**

ProjectNo\_2C R/SF-21 StartDate\_3a \_\_\_\_\_ EndDate\_3b \_\_\_\_\_

ProjectTitle\_4 Heterotrophic bacteria and the food web of the low salinity zone and salt marsh habitats of the San Francisco estuary.....

**CALFed Fellow contact information**

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**Research Mentor (for additional please see #8)**

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**Community Mentor (for additional please see #9)**

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**Additional Research Mentors and Community Mentors**

**Additional Research Mentors\_8**


**Additional Community Mentors\_9**

James Cloern, USGS.....

**Project Objectives: Please type your responses, and answer the questions in a style appropriate for laymen.**

**ProjectObjectives\_10**

Four objectives were outlined in the research proposal.....
1). To evaluate the contribution of bacteria versus phytoplankton for organic matter supply to the estuarine foodweb in open water and restored vs. natural salt marsh habitats.....
2). To determine the bioavailability of autochthonous and exogenous dissolved organic matter (DOM) for bacteria and the relative importance of these sources of DOM in the habitat types listed above.....
3). To investigate bacterial growth efficiency (BGE) in the three habitat types of Suisun Bay and marsh and evaluate the use of BGE as an indicator of marsh restoration success.....
In year one of the fellowship I have made significant progress towards each of the above objectives. Specifically, I have completed objective #1 for the open water habitats of Suisun Bay, and made measurements of bacteria and phytoplankton in spring, summer and fall in Suisun Marsh for comparison. I ran 15 experiments to examine bioavailability of DOM (analysis of results currently underway) to evaluate objective #2. I have also addressed objective 3 for Suisun Bay habitats having completed collected data for approximately 35 individual estimates of bacterial respiration and bacterial growth efficiency. I collected samples (but not yet analyzed) for bacterial respiration and BGE at Suisun Marsh sites for 2007.....

**Summary of progress in meeting each of these goals and objectives**

**ProgressSummary\_11**

I completed biweekly sampling of bacterial abundance and production from March through August at three stations (based on salinity 0.5, 2, and 5psu) in Suisun bay habitats in coordination with the CALFED-supported foodweb study (Kimmerer – lead PI).

I completed sampling at eight stations at least monthly in Suisun marsh (sloughs) from late spring – November. Samples collected included temperature, salinity, dissolved oxygen, nutrients (NO<sub>3</sub>, NH<sub>4</sub>, urea, PO<sub>4</sub>, Si(OH)<sub>4</sub>, Dissolved organic carbon and nitrogen as well as size fractionated chlorophyll-a (<5 μm, >5μm cell size), primary production (using C-13), and bacterial abundance and production. Bacterial production was assessed by leucine incorporation rates in free-living and particle associated (>2.7 μm) fractions.

I participated in eight monthly monitoring cruises (aboard the RV Polaris or small boat) in collaboration with the USGS (Cloern group). These cruises provided the opportunity to supplement budgeted field days as the USGS monthly cruises visit stations within the low salinity zone (0.5 – 5 psu). This also allowed for coordination between this research program and long term San Francisco Bay estuarine monitoring of nutrients and phytoplankton dynamic.

I performed 15 community and bacterial respiration experiments (using changes in dissolved inorganic carbon concentrations in 24-hr incubations) in order to calculate bacterial growth efficiency (<2.7 μm fraction).

I performed 15 bioavailability of dissolved organic matter experiments in Suisun Marsh and Suisun Bay habitats. Experiments were conducted over 21-d (with sampling intervals of 7 days) with samples collected for dissolved inorganic carbon, dissolved organic carbon and nitrogen, bacterial abundance, bacterial production, particulate organic carbon and nitrogen, and inorganic nutrients.

**PROJECT MODIFICATIONS:** Please explain any substantial modifications in research plans, including new directions pursued. Describe major problems encountered, especially problems with experimental protocols and how they were resolved. Describe any ancillary research topics developed.

**Modifications\_12**

I had planned on coordinating sampling with research at the San Francisco Bay National Estuarine Research Reserve (SFNERR). However, SFNERR did not have their “System Wide Monitoring Program” node (which is designed to monitor temperature, salinity, and period chlorophyll-a and nutrients) in place at Hill Slough adjacent to the Rush Ranch Reserve (Suisun Marsh) in 2007. I hope to establish this component of my research program by coordinating my research efforts with their monitoring program in

2008 (see coordinating organizations section).

I training two undergraduate students, Peter Cohen (fall 2007) and Christopher Grace (summer 2007), in sampling for nutrients and microbial ecology field techniques in Suisun Marsh.

The biggest challenged faced was access to the Suisun Marsh sites. I have been coordinating Suisun Marsh sampling with the Peter Moyle's (UC Davis) research group which will allow direct comparisons between phytoplankton and bacterial activity conducted as part of this research project with their estimates of zooplankton and fish densities in Suisun Marsh.

I hope also to partner with Dr. Inge Werner, at UC Davis Aquatic Toxicology Lab for additional boat time in 2008.

**BENEFITS AND APPLICATIONS: Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see <http://science.calwater.ca.gov/pdf/soemgmtcues.pdf>).**

**BenefitsApplic\_13**

Restoration of Habitats and Processes: While results are still preliminary, these results should be useful to estuarine managers as an indicator effectiveness of salt marsh restoration efforts. Microbial physiology may be a sensitive indicator for larger ecosystem change as a result of management activities.

Estuarine Processes: From results in parallel study (CALFED funded "Suisun Bay Food web" Kimmerer - lead PI) it appears that bacteria represent a significant (though smaller than phytoplankton) source of energy and organic matter for higher trophic levels in Suisun Bay. The source of organic carbon that fuels bacterial growth in Suisun Bay is uncertain though a likely source is Suisun Marsh. Therefore, connectivity of Suisun Marsh with the open water habitats of Suisun Bay may be important for maintaining the microbial food web of Suisun Bay.

**PUBLICATIONS:** List any publications, presentations, or posters that have resulted from this funded research. Give as many details as possible, including status of paper (e.g., in review; in press), journal name, conference location and date of presentation. Please note (as outlined in the conditions of the award) that each fellow is required to submit an abstract for an oral or poster presentation at each State of the Estuary conference and CALFED Science Conference during the duration of the fellowship.

**Publications 14**

- Parker, A.E. (2007). "Understanding energy and material flow in the foodweb of the Low Salinity Zone: "progress report" for the heterotrophic bacteria component". Estuarine Ecology Team (EET) Meeting, Tiburon, CA
- Parker, A.E., Hogue, V.E., Wilkerson, F., Dugdale, R.C. (2007). "Estimates of carbon supply from phytoplankton and heterotrophic bacteria to the food web of the northern San Francisco estuary and Suisun Marsh: implications for the pelagic organism decline". Biennial State of the Estuary Conference, Oakland, CA
- Parker, A.E., Hogue, V.E., Wilkerson, F., Dugdale, R.C. (2007). "Evaluating the contribution of bacterioplankton carbon to the foodweb of the northern San Francisco estuary." Estuarine Research Federation Meeting, Providence, RI





**COOPERATING ORGANIZATIONS:** List those agencies and/or persons who provided financial, technical or other assistance to your project since inception. Describe the nature of their collaboration.

**CoopOrganiz\_15**

Current - University of California, Davis, Peter Moyle, PI. - sampling monthly by small boat with the Moyle Research group at 7 stations within Suisun Marsh.

Current - Department of Water Resources, Anke Mueller-Solger - Community mentor for the research project. I have been in regular communication with Dr. Mueller-Solger regarding phytoplankton ecology in the Suisun Marsh study. She provided feedback regarding selection of sampling locations within Suisun Marsh. In addition, Dr. Mueller - Solger gave a seminar at the Romberg Tiburon Center in the Spring 2007 entitled "Down in the Delta: Pelagic organism decline and zooplankton trends and diets in the Sacramento-San Joaquin Delta".

**AWARDS:** List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

**Awards\_16**

N/A

**KEYWORDS:** List keywords that will be useful in indexing your project.

**Keywords\_17**

Suisun marsh, phytoplankton, bacteria, nutrients, dissolved organic matter, salt marsh restoration, pelagic organism decline





